This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1. -74. (canceled)

--75. (new) An isolation bearing for supporting a superstructure relative to a base, said isolation bearing comprising:

an isolation axis;

a lower plate adapted for attachment to said base, said lower plate having an upwardly facing bearing surface;

an upper plate adapted for attachment to said superstructure, said upper plate having a downwardly facing bearing surface;

a pair of sidewall members fixed to said lower plate to define a pair of opposing wall surfaces extending parallel to said isolation axis of said bearing;

a roller situated between and in rolling contact with said upwardly facing bearing surface of said lower plate and said downwardly facing bearing surface of said upper plate;

at least one of said upwardly facing bearing surface and said downwardly facing bearing surface being configured to provide a normal reference position of said roller along said isolation axis toward which said roller is biased under gravitational loading; and

non-linear damping means for providing a damping force for dissipating kinetic energy associated with displacement of said lower plate relative to said upper plate along said isolation axis, said damping force being a non-linear function of the velocity of said lower plate relative to said upper plate.

76. (new) An isolation bearing for supporting a superstructure relative to a base, said isolation bearing comprising:

an isolation axis;

a lower plate adapted for attachment to said base, said lower plate having an upwardly facing bearing surface;

an upper plate adapted for attachment to said superstructure, said upper plate having a downwardly facing bearing surface;

a roller situated between and in simultaneous rolling contact with both said upwardly facing bearing surface of said lower plate and said downwardly facing bearing surface of said upper plate, said roller having a rotational roller axis and a pair of opposite ends;

a pair of sidewall members fixed to said lower plate to define a pair of opposing wall surfaces extending parallel to said isolation axis, each of said pair of opposing wall surfaces facing a respective one of said pair of opposite ends of said roller;

guide means located at the ends of said roller and in contact with said pair of opposing wall surfaces of said sidewall members for maintaining said roller axis in perpendicular relationship to said isolation axis;

at least one of said upwardly facing bearing surface and said downwardly facing bearing surface being configured to provide a normal reference position of said roller along said isolation axis toward which said roller is biased under gravitational loading; and

non-linear damping means for providing a damping force for dissipating kinetic energy associated with displacement of said lower plate relative to said upper plate along said isolation axis, said damping force being a non-linear function of the velocity of said lower plate relative to said upper plate.

77. (new) The apparatus according to claim 76, wherein said guide means is provided by said pair of opposite ends of said roller respectively arranged in surface-to-surface engagement with said pair of opposing wall surfaces of said sidewall members.

78. (new) The apparatus according to claim 76, wherein said guide means is provided by a pair of sliding guides mounted one to each of said pair of opposite ends of said roller and respectively arranged in surface-to-surface engagement with said pair of opposing wall surfaces of said sidewall members.

79. (new) The isolation bearing according to claim 76, wherein said upwardly facing bearing surface has a generally V-shaped profile.

80. (new) The isolation bearing according to claim 76, wherein said pair of sidewall members are designed to withstand a lateral load equal to or greater than the vertical load supported by said isolation bearing.

81. (new) The isolation bearing according to claim 76, wherein at least one of said pair of sidewall members is fixed to said lower plate in a releasable manner to enable relief of said frictional force.

82. (new) The isolation bearing according to claim 76, further comprising a locking mechanism for preventing motion of said upper plate relative to said lower plate along said isolation axis incident to horizontal loading below a predetermined threshold.

83. (new) The isolation bearing according to claim 82, wherein said locking mechanism allows a limited range of motion of said upper plate relative to said lower plate along said isolation axis prior to locking.

84. (new) The isolation bearing according to claim 82, wherein said locking mechanism comprises:

a first member fixed relative to said upper plate, said first member having a pin hole therethrough;

a second member fixed relative to said lower plate, said second member having an elongated travel slot proximately overlapping with said pin hole; and

a locking pin extending through said pin hole and said travel slot.

85. (new) The isolation bearing according to claim 84, wherein said locking pin includes a coupled nut and bolt.

86. (new) The isolation bearing according to claim 82, wherein at least one of said pair of sidewall members includes a threaded hole extending therethrough, and said locking mechanism

comprises a bolt extending through said threaded hole for engaging said upper plate to provide a frictional locking force that is adjustable.

87. (new) The isolation bearing according to claim 76, wherein said non-linear damping means includes a linear spring having one end connected to said lower plate and another end connected to said upper plate.

88. (new) The isolation bearing according to claim 87, wherein said linear spring includes means for adjusting a spring constant thereof.

89. (new) The isolation bearing according to claim 76, wherein said non-linear damping means includes a nonlinear spring having one end connected to said lower plate and another end connected to said upper plate.

90. (new) The isolation bearing according to claim 89, wherein said nonlinear spring is a hardening spring.

91. (new) The isolation bearing according to claim 90, wherein said hardening spring includes an initial dead zone wherein there is no spring force associated with displacement of said upper plate relative to said lower plate, and a secondary dead zone after said primary dead zone wherein said spring force increases linearly with displacement of said upper plate relative to said lower plate.

92. (new) The isolation bearing according to claim 76, wherein said roller is a cylindrical roller having a pair of opposite ends respectively facing said pair of opposing wall surfaces, and said non-linear damping means comprises a sliding guide carried at one of said opposite ends of said cylindrical roller for engaging a respective one of said pair of opposing wall surfaces for providing frictional force.

93. (new) The isolation bearing according to claim 92, wherein said non-linear damping means comprises a pair of sliding guides carried one at each opposite end of said cylindrical roller for respectively engaging said pair of opposing wall surfaces for providing frictional force.

94. (new) The isolation bearing according to claim 93, wherein each of said pair of sidewall members includes a friction track removably attached thereto for defining said pair of opposing wall surfaces, whereby the coefficient of friction between said sliding guides and said wall surfaces is selectable by installing suitable friction tracks.

95. (new) The isolation bearing according to claim 93, wherein each of said pair of sliding guides includes a friction plate removeably attached thereto, whereby the coefficient of friction between said sliding guides and said wall surfaces is selectable by installing suitable friction plates.

96. (new) An isolation bearing for supporting a superstructure relative to a base, said isolation bearing comprising:

an X isolation axis and a Y isolation axis orthogonal to said X isolation axis;

a lower plate adapted for attachment to said base, said lower plate having an upwardly facing bearing surface;

an intermediate plate having a downwardly facing bearing surface and an upwardly facing bearing surface;

an upper plate adapted for attachment to said superstructure, said upper plate having a downwardly facing bearing surface;

a lower roller situated between and in simultaneous rolling contact with both said upwardly facing bearing surface of said lower plate and said downwardly facing bearing surface of said intermediate plate, said lower roller having a rotational roller axis and a pair of opposite ends;

a pair of lower sidewall members fixed to said lower plate to define a pair of opposing wall surfaces extending parallel to said X isolation axis, each of said pair of opposing

wall surfaces of said lower sidewall members facing a respective one of said pair of opposite ends of said lower roller;

an upper roller situated between and in simultaneous rolling contact with both said upwardly facing bearing surface of said intermediate plate and said downwardly facing bearing surface of said upper plate, said upper roller having a rotational roller axis and a pair of opposite ends;

a pair of upper sidewall members fixed to said upper plate to define a pair of opposing wall surfaces extending parallel to said Y isolation axis, each of said pair of opposing wall surfaces of said upper sidewall members facing a respective one of said pair of opposite ends of said upper roller;

lower guide means located at the ends of said lower roller and in contact with said pair of opposing wall surfaces of said lower sidewall members for maintaining said axis of said lower roller in perpendicular relationship to said X isolation axis;

upper guide means located at the ends of said upper roller and in contact with said pair of opposing wall surfaces of said upper sidewall members for maintaining said axis of said upper roller in perpendicular relationship to said Y isolation axis;

at least one of said upwardly facing bearing surface of said lower plate and said downwardly facing bearing surface of said intermediate plate being configured to provide a normal reference position of said lower roller along said X isolation axis toward which said lower roller is biased under gravitational loading; and

at least one of said upwardly facing bearing surface of said intermediate plate and said downwardly facing bearing surface of said upper plate being configured to provide a normal reference position of said upper roller along said Y isolation axis toward which said upper roller is biased under gravitational loading.

97. (new) The isolation bearing according to claim 96, wherein said lower roller and said upper roller are subjected to restorative biasing forces of different magnitudes for biasing said lower roller and said upper roller toward their respective axial reference positions.

98. (new) The isolation bearing according to claim 97, wherein said downwardly facing bearing surface of said intermediate plate has an inverted generally V-shaped profile that is symmetrical about said reference position along said X isolation axis and is characterized by a first slope angle, said upwardly facing bearing surface of said intermediate plate has a generally V-shaped profile that is symmetrical about said reference position along said Y isolation axis and is characterized by a second slope angle, and said first and second slope angles differ in magnitude.

99. (new) The isolation bearing according to claim 96, further comprising non-linear damping means for providing an X axis damping force for dissipating kinetic energy associated with displacement of said lower plate relative to said intermediate plate along said X isolation axis and a Y axis damping force for dissipating kinetic energy associated with displacement of said intermediate plate relative to said upper plate along said Y isolation axis, said X axis damping force being a non-linear function of the velocity of said lower plate relative to said intermediate plate and said Y axis damping force being a non-linear function of the velocity of said intermediate plate relative to said upper plate.

100. (new) The isolation bearing according to claim 99, wherein said lower roller and said upper roller are cylindrical rollers, and said non-linear damping means includes:

a pair of sliding guides carried one at each opposite end of said lower cylindrical roller for respectively engaging said pair of opposing wall surfaces defined by said pair of lower sidewall members for providing frictional force opposing relative motion between said lower roller and said pair of lower sidewall members; and

a pair of sliding guides carried one at each opposite end of said upper cylindrical roller for respectively engaging said pair of opposing wall surfaces defined by said pair of upper sidewall members for providing frictional force opposing relative motion between said upper roller and said pair of upper sidewall members.

101. (new) The isolation bearing according to claim 100, wherein said downwardly facing bearing surface of said intermediate plate has an inverted generally V-shaped profile and said upwardly facing bearing surface of said intermediate plate has a generally V-shaped profile.

102. (new) The isolation bearing according to claim 100, wherein each of said pair of lower sidewall members includes a respective friction track removably attached thereto for defining said pair of opposing wall surfaces, whereby the coefficient of friction between said sliding guides associated with said lower roller and said wall surfaces defined by said lower sidewall members is selectable by installing suitable friction tracks.

103. (new) The isolation bearing according to claim 100, wherein each of said pair of upper sidewall members includes a respective friction track removably attached thereto for defining said pair of opposing wall surfaces, whereby the coefficient of friction between said sliding guides associated with said upper roller and said wall surfaces defined by said upper sidewall members is selectable by installing suitable friction tracks.

104. (new) The isolation bearing according to claim 100, wherein each of said pair of sliding guides associated with said lower roller includes a friction plate removeably attached thereto, whereby the coefficient of friction between said sliding guides associated with said lower roller and said wall surfaces defined by said lower sidewall members is selectable by installing suitable friction plates.

105. (new) The isolation bearing according to claim 100, wherein each of said pair of sliding guides associated with said upper roller includes a friction plate removeably attached thereto, whereby the coefficient of friction between said sliding guides associated with said upper roller and said wall surfaces defined by said upper sidewall members is selectable by installing suitable friction plates.

106. (new) The isolation bearing according to claim 100, wherein said frictional force associated with said sliding guides carried by said lower roller differs from said frictional force associated with said sliding guides carried by said upper roller.

107. (new) The isolation bearing according to claim 100, further comprising a locking mechanism for preventing motion of said intermediate plate relative to said lower plate along said X isolation axis incident to loading directed along said X isolation axis below a predetermined X axis threshold and for preventing motion of said intermediate plate relative to said upper plate along said Y isolation axis incident to loading directed along said X isolation axis below a predetermined Y axis threshold.

108. (new) The isolation bearing according to claim 107, wherein said locking mechanism is independently releasable with respect to said X isolation axis and with respect to said Y isolation axis.

109. (new) The isolation bearing according to claim 108, wherein at least one of said pair of lower sidewall members includes a threaded hole extending therethrough, and said locking mechanism comprises a bolt extending through said threaded hole for engaging said intermediate plate to provide a frictional locking force that is adjustable.

110. (new) The isolation bearing according to claim 108, wherein at least one of said pair of upper sidewall members includes a threaded hole extending therethrough, and said locking mechanism comprises a bolt extending through said threaded hole for engaging said intermediate plate to provide a frictional locking force that is adjustable.

111. (new) The isolation bearing according to claim 99, wherein said non-linear damping means includes:

at least one X-axis spring having one end connected to said lower plate and another end connected to said intermediate plate, said X-axis spring being aligned to act in a direction parallel to or coincident with said X isolation axis; and

at least one Y-axis spring having one end connected to said intermediate plate and another end connected to said upper plate, said Y-axis spring being aligned to act in a direction parallel to or coincident with said Y isolation axis.

112. (new) The isolation bearing according to claim 111, wherein said at least one X-axis spring includes a linear spring and said at least one Y-axis spring includes a linear spring.

113. (new) The isolation bearing according to claim 111, wherein said at least one X-axis spring includes a hardening spring and said at least one Y-axis spring includes a hardening spring.

114. (new) A seismically isolated structure comprising:

an isolation axis;

a base;

an upwardly facing bearing surface fixed relative to said base;

a superstructure;

a downwardly facing bearing surface fixed relative to said superstructure;

a roller situated between and in rolling contact with said upwardly facing bearing surface and said downwardly facing bearing surface;

at least one of said upwardly facing bearing surface and said downwardly facing bearing surface being configured to provide a normal reference position of said roller along said isolation axis toward which said roller is biased under gravitational loading; and

non-linear damping means for providing a damping force for dissipating kinetic energy associated with displacement of said base relative to said superstructure along said isolation axis, said damping force being a non-linear function of the velocity of said base relative to said superstructure.

115. (new) The seismically isolated structure according to claim 114, wherein said non-linear damping means includes means for frictional damping.

116. (new) The isolation bearing according to claim 114, wherein said non-linear damping means includes a visco-elastic damper.

117. (new) The isolation bearing according to claim 114, wherein said non-linear damping means includes a linear spring.

118. (new) The isolation bearing according to claim 117, wherein said linear spring includes means for adjusting a spring constant thereof.

119. (new) The isolation bearing according to claim 114, wherein said non-linear damping means includes a nonlinear spring.

120. (new) The isolation bearing according to claim 119, wherein said nonlinear spring is a hardening spring.

121. (new) An isolation bearing for supporting a superstructure relative to a base, said isolation bearing comprising:

an isolation axis;

a lower plate adapted for attachment to said base, said lower plate having an upwardly facing bearing surface;

an upper plate adapted for attachment to said superstructure, said upper plate having a downwardly facing bearing surface;

a roller situated between and in simultaneous rolling contact with both said upwardly facing bearing surface of said lower plate and said downwardly facing bearing surface of said upper plate, said roller having a rotational roller axis and a pair of opposite ends;

a pair of sidewall members fixed to said lower plate to define a pair of opposing wall surfaces extending parallel to said isolation axis, each of said pair of opposing wall surfaces facing a respective one of said pair of opposite ends of said roller; and

guide means located at the ends of said roller and in contact with said pair of opposing wall surfaces of said sidewall members for maintaining said roller axis in perpendicular relationship to said isolation axis;

wherein at least one of said upwardly facing bearing surface and said downwardly facing bearing surface is a cylindrical surface.

122. (new) The isolation bearing according to Claim 121, wherein one of said upwardly facing bearing surface and said downwardly facing bearing surface is a cylindrical surface, and the other of said upwardly facing bearing surface and said downwardly facing bearing surface has a generally V-shaped profile.

123. (new) The isolation bearing according to Claim 122, wherein said generally V-shaped profile is characterized by a smoothly curved transition zone across an imaginary vertex of said generally V-shaped profile, wherein said transition zone has a radius of curvature that is greater than a radius of said roller .

124. (new) The isolation bearing according to Claim 123, wherein said transition zone is defined by a non-metallic damping insert.

125. (new) The isolation bearing according to Claim 124, wherein said damping insert is formed of rubber or viscoelastic material.

126. (new) An isolation bearing for supporting a superstructure relative to a base, said isolation bearing comprising:

a lower plate adapted for attachment to said base, said lower plate having an upwardly facing bearing surface;

an upper plate adapted for attachment to said superstructure, said upper plate having a downwardly facing bearing surface; and

a roller situated between and in rolling contact with said upwardly facing bearing surface of said lower plate and said downwardly facing bearing surface of said upper plate;

wherein at least one of said upwardly facing bearing surface and said downwardly facing bearing surface has a generally V-shaped profile characterized by a smoothly curved transition zone across an imaginary vertex of said generally V-shaped profile, said transition zone having a radius of curvature that is greater than a radius of said roller.

127. (new) The isolation bearing according to Claim 126, wherein said transition zone is defined by a non-metallic damping insert.

128. (new) The isolation bearing according to Claim 127, wherein said damping insert is formed of rubber or viscoelastic material.

129. (new) The isolation bearing according to Claim 127, wherein one of said upwardly facing bearing surface and said downwardly facing bearing surface has said generally V-shaped profile, and the other of said upwardly facing bearing surface and said downwardly facing bearing surface has a flat profile.

130. (new) The isolation bearing according to Claim 126, wherein one of said upwardly facing bearing surface and said downwardly facing bearing surface has said generally V-shaped profile, and the other of said upwardly facing bearing surface and said downwardly facing bearing surface has a flat profile.

131. (new) The isolation bearing according to Claim 130, wherein said upwardly facing bearing surface is coated by a layer of damping material.

132. (new) The isolation bearing according to Claim 131, wherein an external surface of said roller is coated by a layer of damping material.

133. (new) The isolation bearing according to Claim 130, wherein said downwardly facing bearing surface is coated by a layer of damping material.

134. (new) The isolation bearing according to Claim 133, wherein an external surface of said roller is coated by a layer of damping material.

135. (new) The isolation bearing according to Claim 134, wherein said upwardly facing bearing surface is coated by a layer of damping material.

136. (new) The isolation bearing according to Claim 126, wherein both of said upwardly facing bearing surface and said downwardly facing bearing surface have a generally V-shaped profile characterized by a smoothly curved transition zone across an imaginary vertex thereof, said transition zone having a radius of curvature that is greater than a radius of said roller.

137. (new) The isolation bearing according to Claim 136, wherein each said transition zone is defined by a non-metallic damping insert.

138. (new) The isolation bearing according to Claim 137, wherein each said damping insert is formed of rubber or viscoelastic material.

139. (new) The isolation bearing according to Claim 126, wherein an external surface of said roller is coated by a layer of damping material.

140. (new) An isolation bearing for supporting a superstructure relative to a base, said isolation bearing comprising:

a lower plate having an upwardly facing bearing surface;

an upper plate having a downwardly facing bearing surface;

a roller situated between and in rolling contact with said upwardly facing bearing surface of said lower plate and said downwardly facing bearing surface of said upper plate, at least one of said upwardly facing bearing surface and said downwardly facing bearing surface having a generally V-shaped profile; and

guide means for maintaining rolling motion of said roller relative to said upwardly facing bearing surface and rolling motion of said roller relative to said downwardly facing

bearing surface along a common travel axis, wherein said roller has an axis of rotation extending laterally relative to said travel axis, and said guide means acts between said roller and one of said lower plate and said upper plate, and between said lower plate and said upper plate.

141. (new) The isolation bearing according to Claim 140, wherein said guide means comprises a pair of sidewalls fixed to said one of said lower plate and said upper plate, each of said pair of sidewalls extending parallel to said travel axis, and said roller is located between said pair of side walls such that each opposite end of said roller is proximate to a respective one of said pair of sidewalls.

142. (new) An isolation bearing for supporting a superstructure relative to a base, said isolation bearing comprising:

an isolation axis;

a lower plate having an upwardly facing bearing surface;

an upper plate having a downwardly facing bearing surface;

a roller situated between and in simultaneous rolling contact with both said upwardly facing bearing surface of said lower plate and said downwardly facing bearing surface of said upper plate, said roller having a rotational roller axis and a pair of opposite ends;

a pair of sidewall members fixed to said lower plate to define a pair of opposing wall surfaces extending parallel to said isolation axis, each of said pair of opposing wall surfaces facing a respective one of said pair of opposite ends of said roller;

one of said upwardly facing bearing surface and said downwardly facing bearing surface having a generally V-shaped profile and the other of said upwardly facing bearing surface and said downwardly facing bearing surface having a flat profile; and

guide means located at the ends of said roller and in contact with said pair of opposing wall surfaces of said sidewall members for maintaining said roller axis in perpendicular relationship to said isolation axis.--